

# 4-10 MHz SHORTWAVE RADIO



**Ramsey Electronics Model No.      SR-1**

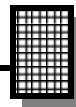
*Have you ever wanted to get into the fascinating world of radio? The Ramsey SR-1 is a fine performer that will bring in the world using just a few feet of wire as an antenna! Folks of all ages have successfully built and enjoyed this easy and fun kit.*

- Enjoy hours of fascinating international listening using just a simple indoor wire antenna
- Select any 2.5MHz portion of the 4 to 10MHz shortwave band, easily re-tuned at any time.
- Smooth varactor diode tuning
- Excellent sensitivity and selectivity
- Front panel RF Gain, Volume, and Tuning controls
- Multi-stage audio amplifier for room filling volume
- Well designed superhetrodyne circuit is easy to build, makes a nice one-evening project
- Ideal scout, school, or club project
- Clear, concise step-by-step instructions carefully guide you to a finished kit that not only works - but you'll also learn too!
- Runs on a standard 9 volt battery
- Add our matching case and knob set for a finished 'pro' look.

*Check out the excellent magazine reviews in:*

- ✓ August 1989, 73: *Amateur Radio Today*
- ✓ September 1990, *Popular Electronics*
- ✓ November 1991, *Radio Fun*

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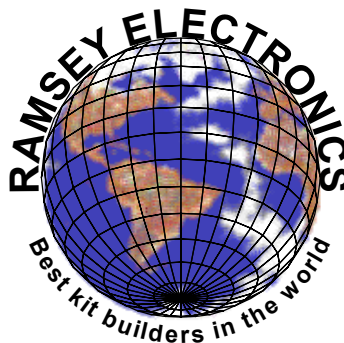
- SG-7 Personal Speed Radar
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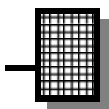
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4-10MHz SHORTWAVE RADIO INSTRUCTION MANUAL  
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## KIT ASSEMBLY AND INSTRUCTION MANUAL FOR

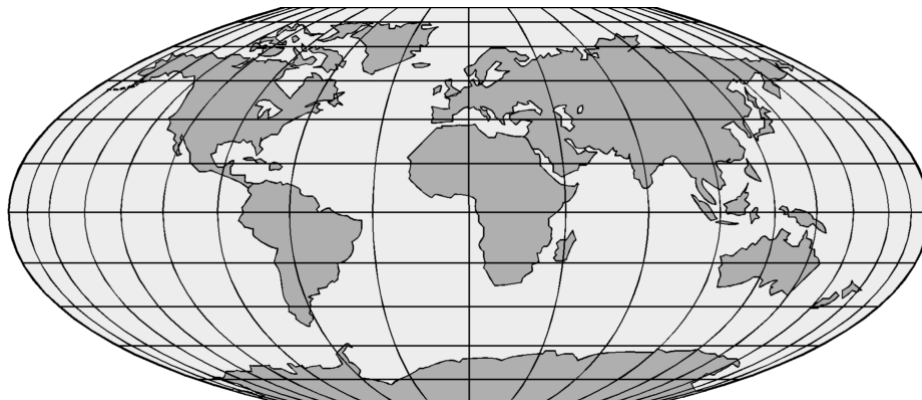
# 4-10MHz SHORTWAVE RADIO

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# RAMSEY

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## **INTRODUCTION TO THE SR-1**

The SR-1 is a single-conversion superheterodyne receiver designed specifically for listening to AM broadcasting stations in the range of 4 to 10 Mhz. Because of this "superhet" design, your favorite foreign broadcasting services will come in loud and clear, with pleasing audio sound quality, with a minimum of overload, frequency drift or heterodyne whistles. Because of this broadcast oriented design, other shortwave signals such as Morse code (CW), single-sideband (SSB) voice communications and some Teletype signals will usually sound like garbled hisses. On the other hand, similarly inexpensive receivers designed for CW and SSB can give only marginal performance in receiving broadcast stations due to the lack of superheterodyne design. For example, our popular Ramsey direct-conversion receivers for the 80,40,30 and 20 Meter Amateur bands will also pick up AM broadcast stations, but you'll mainly hear their strong AM "carrier" signal due to the lack of the superheterodyne circuitry. Even if such a carrier is tuned to a "null," listening fidelity is less than desirable.

## **WHAT YOU CAN EXPECT TO HEAR**

First, let's take a look at what is POSSIBLE to hear on your SR-1. The following are the international shortwave broadcasting bands within its tuning range:

- 4.750-5.060 Mhz. (Lower power, regional "tropical" broadcasting)
- 5.950-6.200 Mhz (Late evening)
- 7.100-7.300 Mhz. (Late afternoon, early evening) (This band is always shared with the 7.0-7.3 Mhz Amateur Radio Band)
- 9.500-9.900 Mhz. (Always "something" on, 24 hours a day!)

Especially strong signals include these, among others:

- BBC London: an intelligent perspective on world affairs

- Radio Canada International: editorial quality similar to BBC
- Radio Moscow: powerful signals, increasingly honest and open
- Voice of America: VOA broadcasts are "aimed" outside the USA, but if you're in the "path" you'll hear it loud and clear!
- U.S. Armed Forces Radio-TV "Feed" Service: master programming source for U.S. military radio- hear CBS-NBC-ABC-Mutual news all on the same "channel," plus many other features and spots which give a feel for how it's going with those in uniform.
- Numerous South American stations
- USA religious broadcasting to other continents

You'll easily tune in broadcasts from many other countries as well. As you become more and more familiar with the world of shortwave broadcasting, you'll be deciding on your own favorite band.

You will hear a variety of other "interesting" sounds, but just remember that this receiver is designed for AM only. If a Morse Code signal really sounds "good," it is because it is being transmitted in AM tone-modulated form, or perhaps the signal is so close to an AM broadcast carrier that the carrier acts as a "beat-frequency-oscillator" (BFO). Even though this receiver can let you tune through several different ham radio bands, the signals are not likely to be intelligible. Reception of CW and SSB signals on an AM receiver requires a BFO. This is not a complicated feature, but it is beyond the purpose of the SR-1. Our companion receivers designed for the HAM bands will let you tune into these SSB and CW broadcasts.

### **SHORTWAVE LISTENING AS A HOBBY IN ITSELF**

Many people worldwide enjoy listening to shortwave broadcasts of all kinds, and they keep written records of what they hear. Almost every nation on earth has some sort of shortwave broadcast service, though many are much more challenging to tune than the powerful signals of Radio Moscow and the BBC. In addition, these "SWLs" (Shortwave Listeners) listen to ham operators, government and commercial stations and even clandestine operations. Some shortwave listeners enjoy collecting QSL cards from stations which they have logged. Shortwave listening is, for some, a step toward getting a ham radio license. For others, it is a great hobby in itself. The SR-1 Shortwave Receiver is a good introductory receiver for this hobby. After you decide exactly what kinds of listening are of the most interest to you, you'll be in a better position to choose a more elaborate receiver. While there are various multi-band portable radios available, you can expect to pay

at least \$100 for a receiver offering a significant improvement over your trusty SR-1.

To learn more about this SWL hobby, look for a copy of "Popular Communications" at newsstands. An inexpensive and interesting general introduction to all kinds of radio listening is the book, "Shortwave Listening Guide" by William Bardet, Jr. (1987; Radio Shack Catalog Number 62-1084). This book also includes helpful introductory information about VHF monitoring, which you can enjoy with the Ramsey FR-146 and AR-1 receiver kits, as well as ham radio, CB, antennas, and other topics.

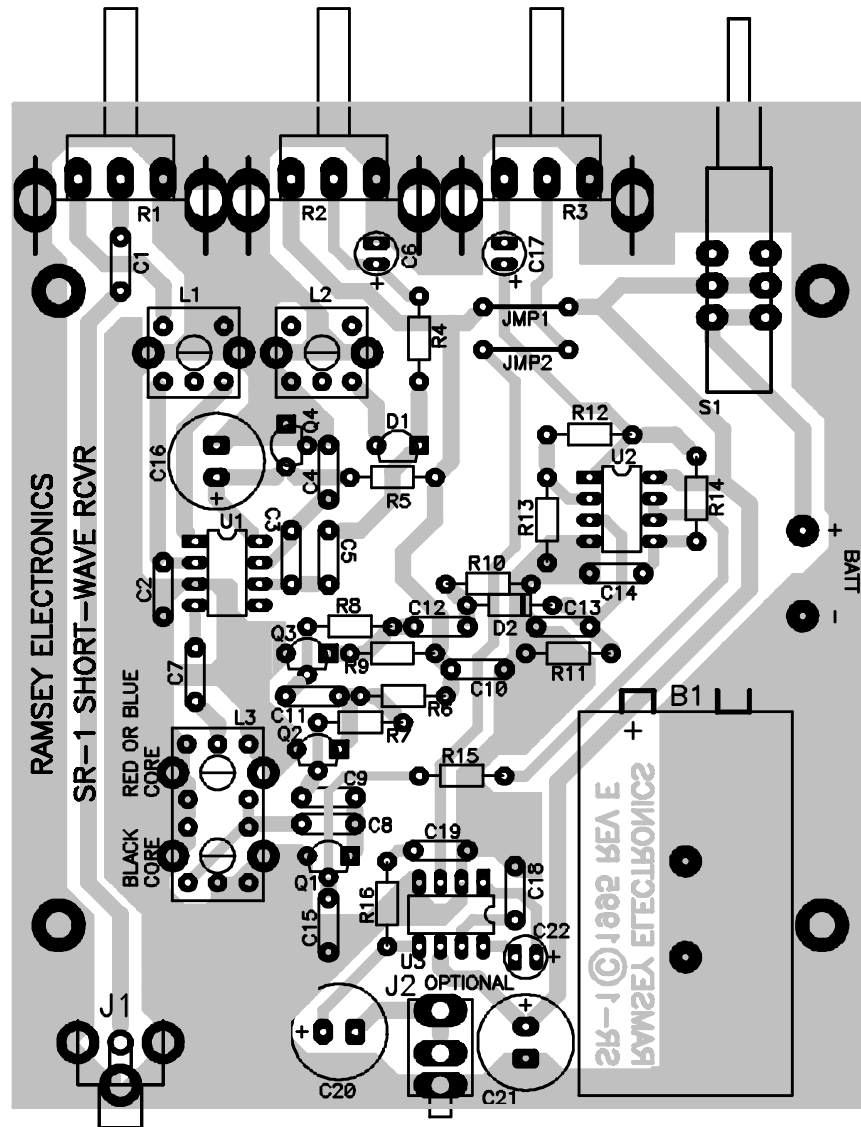
To learn more about Ramsey Electronics ham radio kits, write for our complete catalog. (And, be sure to tell us how you're doing with your SR-1 Receiver!) To learn more about the hobby of ham radio, write ARRL (American Radio Relay League), 225 Main Street, Newington, CT 06111.

### **CIRCUIT DESCRIPTION**

The NE602 IC is a combination oscillator-mixer. Signals from the antenna are peaked by L1 and fed to pins 1 and 2. The oscillator frequency is determined by C3, C4, L2 and the varactor tuning network (D1, R2, etc.). The use of a hyper-abrupt style varactor diode permits a tuning range of over 2.5 Mhz by R2. The mixer output is applied to the 260 Khz bandpass IF transformer and amplified by Q2 and Q3. The AM audio is detected by D2 and preamplified by U2(A) before being boosted to speaker level by the LM386 IC. U2(B) and Q1 provide AGC (automatic gain control).

The very low 260 Khz IF affords exceptional gain and selectivity characteristics and also offers a sort of "bonus" that would not be normally welcome in a receiver intended for communications and listening for very weak signals. In tuning your SR-1 receiver, it is useful to understand that you will hear any signal at the oscillator frequency PLUS 260 Khz and also at that frequency MINUS 260 Khz. This is not a problem for general listening to shortwave broadcasts, as long as you realize that you'll find every broadcast twice as you pass through the 2.5+ Mhz range of the Tuning control. The circuitry required to minimize this "image" reception would defeat the goal of economy and simplicity intended for the SR-1. More elaborate superhet receivers deal with this phenomenon by using a higher intermediate frequency, several IF stages and very exact tuning of the antenna input circuit. However, you will find the SR-1 to give perkier reception with simple antennas than do many much more costly portable receivers.

# SR-1 PARTS LAYOUT DIAGRAM



## **PARTS LIST**

### **CAPACITORS**

- ☐ 3 100 pF disc capacitors (marked 100, 101, or 100K) (C3,7,8)
- ☐ 11 .01 $\mu$ F disc capacitors (marked .01, 103, or 10nF)  
(C1,2,5,9,10,11,12,13,14,15,18)
- ☐ 3 4.7 $\mu$ F to 10 $\mu$ F electrolytic capacitors (C6,17,22)
- ☐ 3 100 to 220 $\mu$ F electrolytic capacitors (C16,20,21)
- ☐ 1 .1 $\mu$ F ceramic disc capacitor (marked .1 or 104) (C19)
- ☐ 1 10 pF ceramic disc capacitor (marked 10)(C23)

### **INDUCTORS**

- ☐ 2 Shielded coils (marked 5015-015) (L1,L2)
- ☐ 2 1800  $\mu$ H inductors (marked 182J)(L3)

### **RESISTORS**

- ☐ 1 2 ohm [red-black-gold] (R16)
- ☐ 1 270 ohm [red-violet-brown] (R5)
- ☐ 2 1K ohm [brown-black-red] (R6,R9)
- ☐ 3 10K ohm [brown-black-orange] (R4,R10,R11)
- ☐ 3 47K ohm [yellow-violet-orange] (R7,R8,R15)
- ☐ 2 100K ohm [brown-black-yellow] (R12,R13)
- ☐ 1 1M ohm [brown-black-green] (R14)

### **SEMICONDUCTORS**

- ☐ 1 1N270 diode, glass bead style (D2)
- ☐ 1 Varactor diode, transistor style body with two leads (MVAM108) (D1)
- ☐ 4 NPN transistors, 2N3904 or similar (Q1,2,3,4)
- ☐ 1 NE602 8-pin DIP IC (U1)
- ☐ 1 LM358 8-pin DIP IC (U2)
- ☐ 1 LM386 8-pin DIP IC (U3)

### **HARDWARE AND MISCELLANEOUS**

- ☐ 1 SR-1 printed circuit board
- ☐ 3 10K potentiometers (R1,2,3)
- ☐ 1 DPDT PC-mount push button switch (S1)
- ☐ 1 RCA-type PC-mount jack (J1)
- ☐ 1 Subminiature phone jack (J2)
- ☐ 1 9-volt battery snap connector
- ☐ 1 9-volt battery hold-down clamp

### **REQUIRED, NOT SUPPLIED:**

- ☐ 9-volt alkaline or heavy-duty battery
- ☐ Earphone, small speaker, or external amplifier with speaker
- ☐ Antenna or suitable cable, connector, grounding

### **OPTIONAL**



## **ASSEMBLY INSTRUCTIONS**

In ALL PC-board assembly steps, our word "INSTALL" means to do this:

- ☐ Insert the part, oriented or "pointed" correctly, into its holes in the PC board.
- ☐ If helpful, gently BEND the part's wire leads or tabs to hold it in place, with the body of the part snugly against the top side ("component side") of the circuit board.
- ☐ Solder ALL wires or pins of the part.
- ☐ Trim or "nip" all excess wire lengths extending beyond each solder connection, taking care that wire trimmings do not become lodged in solder connections.

You can see that this circuit board, the center portion in particular, is fairly well-filled with components. There's more to this receiver than the average beginner's radio or even our popular Amateur Band receivers.

Follow the assembly instructions IN SEQUENCE and check off each step as understood and completed. Some of the components require modification! Examine the schematic circuit diagram and PC Board parts layout diagram as you proceed.

Use good soldering techniques! Let your soldering iron tip heat both the component lead wire and PC board trace enough so that the wire itself AND the foil trace BOTH become hot enough TOGETHER to melt a bit of solder so that it flows smoothly from the pin to the PC board trace.

### ***Enough said... Let's get building!***

- ☐ 1. Install J1, the RCA antenna jack. Solder all 4 points.
- ☐ 2. Install S1, the DC on-off switch. It fits only one way. Ensure that the white plastic switch extends out over the edge of the printed circuit board.
- ☐ 3. Install C1, a .01  $\mu$ F (marked .01 or 103) signal coupling capacitor, which brings the antenna signal up to the front of the PC board. Notice the long PC trace from J1 through C1 to R1.
- ☐ 4. Install potentiometer R1, the RF gain control.
- ☐ 5. Now, it's time for a little "destruction"! (If you jumped ahead and installed L1 and L2, we've got bad news for you). Before these two

shielded transformers can be installed, their internal capacitors need to be removed. Looking at the underside of these two transformers, you'll see a tubular part, probably white with a brown band, somewhat like the resistors in this kit. These are brittle and easily crushed with any sharp object that can be pressed against them with mild force (small nail, nutpick, small screwdriver). You'll find these capacitors will easily disintegrate into particles. DO NOT do anything to the larger dual IF transformer, L3.

- ☐ 6. Install L1, which peaks or preselects the signal input from the antenna through C1 and R1.
- ☐ 7. Install U1, the NE602 IC mixer oscillator. The marked end of the IC (band or dot) must face the FRONT of the PC board (the end with the switch and dials.) If you wish, install an 8-pin DIP socket, still remembering to orient and install correctly. Please don't be afraid to solder U1 directly to the PC board, as we have seen more repair problems associated with DIP sockets than from direct soldering of IC chips!
- ☐ 8. Install C2, .01  $\mu$ F (marked .01 or 103). C2 will bypass pin 2 of the NE602 to ground. The antenna signal coupled through C1, level controlled by R1, peaked by L1 is now fed to input pins 1 and 2 of the NE602. Pin 3 of the NE602 is now connected to ground, as required.
- ☐ 9. Install C16, a large 100 or 220  $\mu$ F electrolytic. The positive side must face towards the NE602. (Note: The prominent stripe on the side of the capacitor usually designates the negative side, not the positive side).
- ☐ 10. Install Q4, NPN 2N3904 next to C16. Note the orientation of the flat side.
- ☐ 11. Install C3, 100 pF (marked 100 or 101), which goes across pins 6 and 7 of the NE602 IC. This capacitor is a first step in setting up the resonant frequency of the NE602's internal oscillator, using the resonant LC circuit to be created along with C4, L2 and the varactor tuning circuit.
- ☐ 12. Install C4, 100 pF (marked 100, 101 or 100K).
- ☐ 13. Install C5, .01  $\mu$ F (marked .01 or 103).
- ☐ 14. Install Jumper Wire, JMP1, using a scrap of bare wire trimmed from a previously-installed part. This jumper is an "overpass" which brings +9 volts to the NE602 and varactor tuning.
- ☐ 15. Near to Jumper 1, install R4, 10K [brown-black-orange].
- ☐ 16. Before L2 may be installed, its internal capacitor must be removed by crushing it with a small screwdriver or knife blade, just as for L1. Omitting this step will prevent the oscillator from tuning the intended frequency

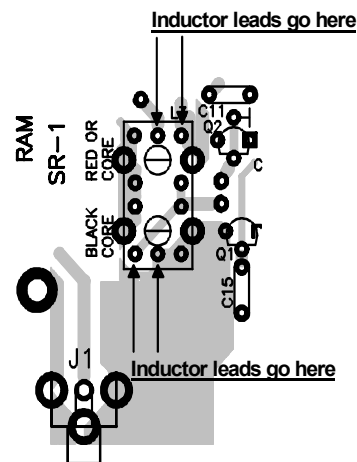
range.

- ☐ 17. Install L2, the oscillator coil.
- ☐ 18. Install D1, the varactor diode, which looks just like a transistor but with only two leads, making sure that the flat side is oriented correctly.
- ☐ 19. Install R5, 270 ohm (red-purple-brown)
- ☐ 20. Install R2, 10K potentiometer tuning control.
- ☐ 21. Install C6, 10  $\mu$ F. electrolytic below R2.
- ☐ 22. Install R3, 10K potentiometer volume control.
- ☐ 23. Install C9, .01  $\mu$ F (marked .01, 103 or 10nF).

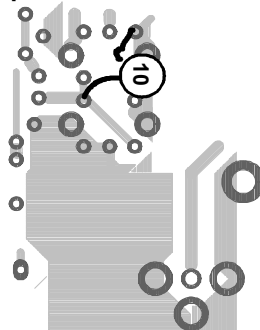
### **PROGRESS SUMMARY**

In addition to becoming familiar with the PC board and installing a respectable number of parts, you've made TWO accomplishments worth noting. First, you have modified L1 and L2 as needed. Second, if you'll peek at the left "third" of the schematic diagram, following from the antenna to C7, you already have built a "direct conversion" shortwave receiver capable of CW-SSB reception throughout the SR-1's tuning range. If you want to prove it to yourself, connect an antenna, 9 volts DC to Jumper 1, and a high-gain test amplifier to C7. You will hear plenty of CW-RTTY shortwave signals as well as the "carrier" signals of the AM broadcast signals which this SR-1 superhet receiver is designed to detect and amplify. .

- ☐ 24 Locate the two green 1800  $\mu$ H inductors (marked 182J). These inductors will be placed in the position marked for L3. Follow the diagram at right for proper placement of the inductors.



**10 pF capacitor on back of board**



- ☐ 25. Flip the circuit board over and install a 10 pF capacitor on the bottom side of the board between the two inductors installed in step 24. (see below for placement)

- ☐ 26. Install C15, .01  $\mu$ F (marked .01, 103 or 10nF).
- ☐ 27. Install C7 and C8, both 100 pF (marked 100, 101 or 100K).
- ☐ 28. All four transistors used in the SR-1 are identical NPN type 2N3904 or similar. Transistors are installed just like any other part - don't be afraid to use enough heat to make good, clean connections. When installing transistors, gently work their three leads to slide into the three holes at the same time, don't try to pre-form the wires. Press firmly without jamming too hard.
- ☐ 29. Install NPN transistor Q1 per step #29.
- ☐ 30. Install NPN transistor Q2 per step #29.
- ☐ 31. Install C11, .01 $\mu$ F (marked .01, 103 or 10nF).
- ☐ 32. Install R7, 47K [yellow-purple-orange].
- ☐ 33. Install R6, 1K [brown-black-red].
- ☐ 34. Install C10, .01  $\mu$ F (marked .01, 103 or 10nF).
- ☐ 35. Install R8, 47K [yellow-purple-orange].
- ☐ 36. Install R9, 1K [brown-black-red].
- ☐ 37. Install C12, .01  $\mu$ F (marked .01, 103 or 10nF).
- ☐ 38. Referring to Step 29, install NPN transistor Q3.
- ☐ 39. Install 1N270 glass bead diode D2. The banded end (cathode) MUST be oriented as shown on parts layout.
- ☐ 40. Install C13, .01  $\mu$ F (marked .01, 103 or 10nF).
- ☐ 41. Install R11, 10K [brown-black-orange].
- ☐ 42. Install R13, 100K ohms [brown-black-yellow].
- ☐ 43. Install R12, 100K ohms [brown-black-yellow].
- ☐ 44. Install R14, 1 megohm [brown-black-green].
- ☐ 45. Refer, if necessary, to Step 7 regarding the NE602 IC already installed. Install U2, the LM358 IC, making very sure that its notched end is toward the front of the PC board.
- ☐ 46. Install C14, .01  $\mu$ F (marked .01, 103 or 10nF).
- ☐ 47. Install Jumper Wire, JMP2.
- ☐ 48. Install R10, 10K [brown-black-orange].
- ☐ 49. Install R15, 47K [yellow-purple-orange].

- ☐ 50. Install R16, 2 ohm [red-black-gold].

### **PROGRESS SUMMARY**

Your shortwave broadcast receiver is now finished, except for using just a few more parts to build a very effective speaker amplifier circuit.

- ☐ 51. Near R3 (volume control), install C17, 10  $\mu$ F. electrolytic. This and most remaining capacitors are polarized electrolytics, so please watch your (+) and (-) designations and part orientations!
- ☐ 52. Install C18, .01  $\mu$ F (marked .01, 103 or 10nF).
- ☐ 53. Install U3, the LM386 audio amplifier IC chip. The notched or banded end MUST face to the right (battery area).
- ☐ 54. Install C19, .1  $\mu$ F (marked .1 or 104).
- ☐ 55. Install C20, 100 to 220  $\mu$ F. electrolytic.
- ☐ 56. Install C21, 100 to 220  $\mu$ F. electrolytic.
- ☐ 57. Install J2, the subminiature speaker-headphone jack.
- ☐ 58. Install the 9-volt battery snap connector, making sure that the red (+) and black (-) leads are inserted correctly.
- ☐ 59. If you desire increased audio output, C22, 10  $\mu$ F, may be installed.
- ☐ 60. Install the battery clamp. Position battery and holder so as not to cover nearby PC board mounting holes. Use the method for securing the clamp that is most convenient for you, such as:
  - wire looped through clamp and PC board holes, soldered.
  - small screws
  - double-faced adhesive strips
  - hot-melt glue

### **SHORTWAVE ANTENNA IDEAS**

The type of antenna you'll want to use for your SR-1 depends on the degree of interest you have in shortwave listening, on whether you are limited to an indoor or balcony antenna, and on whether you think you may soon want to obtain a ham radio license. If the latter is true, you may want to consult ham radio literature and build the dipole or vertical antenna which you also plan to use for ham listening and transmitting. A 40-meter (7 Mhz) antenna is quite nice for the tuning range of the SR-1.

The rest of these notes on antennas are for the benefit of SR-1 builders who simply wish to enjoy some shortwave broadcast listening. The SR-1 is very

sensitive, so its antenna requirements are minimal for casual evening listening when international broadcast signals are quite strong. 10 to 20 feet of insulated hookup wire can be neatly strung behind furniture and curtains for an adequate indoor antenna. The same length of wire, or more, outdoors or up in the attic, will be an even better receiving antenna.

- 1. The ideal antenna setup for this frequency range is considered to be an outdoor wire 25 to 50 feet in length, with the ground side of the antenna jack connected to a copper cold water pipe.
- 2. For convenience, a short length of audio cable with pre-wired RCA plug is adequate for making antenna and ground connections. (RF coaxial cable is not essential for this application).
- 3. A "banana plug" may also be plugged into the antenna jack but will not provide a ground connection.
- 4. If an indoor antenna is necessary, simply make it as long as possible and as high up from concrete floors as you can.
- 5. When installing any outdoor antenna, BE VERY CAREFUL not to let your antenna wire come in contact with electric power lines.
- 6. Any antenna wire for shortwave listening may run horizontally, vertically or some both ways, or at an angle!
- 7. If you have a roof-mounted TV antenna, its feedline will make a great antenna for your SR-1.
- 8. Some existing objects such as; metal downspouts, gutters, windows, door screens, or attic insulation foil can serve as antennas!

If you are completely restricted to indoor antennas, you will enjoy the extra boost of the Ramsey Active Antenna Kit, model AA-7. It's built-in whip antenna can also be boosted by your simple indoor wire antenna, and the AA-7 may be used with any receiver or even a VHF scanner. It's easy to build and a nice companion for your SR-1. If you need more construction details on antennas, check the book mentioned on page 6, or any introductory ham radio book, or the Radio Shack book on Antennas (No. 62-1083).

## **INITIAL TESTING AND ADJUSTMENT**

Before turning on your receiver, please double-check the following:

- ☐ correct orientation of all three IC's.
  - ☐ correct orientation of flat side of all four transistors.
  - ☐ correct orientation of the two diodes.
  - ☐ correct polarity of all electrolytic capacitors.
- 
- ☐ 1. Connect a speaker or earphones and antenna.
  - ☐ 2. Install a fresh 9-volt alkaline battery.
  - ☐ 3. Set all three potentiometer controls to their middle positions.
  - ☐ 4. Turn ON the receiver.

After adjusting the volume to a pleasant level, you should hear some shortwave stations by turning the Tune control, no matter how any of the adjustable coils happen to be set. Turn the RF Gain control to make sure it is working and then set it at the lowest level needed for good reception.

While listening to any kind of station, whether broadcast or Teletype, etc., use a small screwdriver to adjust both slugs in the dual transformer for the best-sounding reception. The black slug will be almost to the top of its range (fully counterclockwise). The blue slug will give peak reception about two turns clockwise down from its highest position.

The Tuning Control covers any 2.5 Mhz. segment selected by adjustment of oscillator coil L2. Both L1 and L2 must be adjusted with a non-metallic alignment tool such as is used in radio-TV service. If you do not have one, a suitable tool can be made by patiently sanding a screwdriver-like blade on the end of a wooden match stick, kabob skewer or small plastic crochet needle. Again, please be aware that a metal screwdriver blade will drastically increase the coil inductance and make adjustment quite difficult. L1 is simply adjusted for strongest reception of any signal range that is tuned in.

If you are without any kind of testing or frequency reference equipment whatsoever, the easiest way to start enjoying your SR-1 is, with the Tune control set at its midpoint, to slowly tune L2 with your alignment tool as though it were a tuning dial. Stop when you come into the middle of a group or cluster of foreign broadcast stations. Try tuning around these stations with the Tune control. If you like what you hear, readjust both L1 and L3 for best reception. Eventually, you will get a clue as to what general frequency band you are hearing, because many stations periodically announce their frequencies, particularly at sign-on and sign-off times.

If you like precision, use a frequency counter or calibrated receiver to find the SR-1's strong oscillator signal, remembering that there is a 260 KHz IF difference between the local oscillator frequency and the broadcast signal you are hearing.

Following are results of tests on an SR-1 to give you a general guideline on what to expect if you want to pre-set adjustments of oscillator coil L2. Each turn of L2 is one full turn clockwise. Please realize the margin of error from receiver to receiver in such measurements, due to the manufacturing tolerances of the capacitors and coils involved. Also, notice how the amount of frequency change per turn increases with each turn. However, we can see that a setting of somewhere between 4 and 5 turns might permit tuning of all three of the major shortwave bands under 10 Megahertz, depending on the characteristics of your particular varactor diode. A 2.5 Mhz. swing is all that we can reasonably guarantee.

L2 SETTING	OSCILLATOR RANGE	TUNING RANGE
Flush at top of shield	3.94-6.77 Mhz	3.68-7.03 Mhz
1 turn	4.01-6.87 Mhz	3.75-7.13 Mhz
2 turns	4.27-7.31 Mhz	4.01-7.57 Mhz
3 turns	4.77-8.20 Mhz	4.51-8.46 Mhz
4 turns	5.50-9.30 Mhz	5.24-9.56 Mhz
5 turns	6.31-9.83 Mhz	6.05-10.09 Mhz
6 turns	7.10-10.20 Mhz	6.84-10.46 Mhz
Maximum	7.27-10.25 Mhz	7.01-10.51 Mhz



## **TROUBLESHOOTING TIPS**

If you experience difficulty, think of your SR-1 in its several sections or stages: oscillator-mixer (NE602), IF audio and AGC, and final audio output (LM386). The first step in case of problems is to make sure that the tunable oscillator is working, which can be done by listening for its signal on another receiver. After the oscillator circuit is confirmed working, standard signal tracing procedures should isolate any problem, which will be either an incorrectly-installed part, a defective part or a bad solder connection. Correct orientation or polarity of all diodes, transistors, electrolytic capacitors and ICs is essential.

**PROBLEM:** Self-oscillation or motorboating

**SOLUTION:** Be certain that C6 is a 4.7 to 10  $\mu\text{F}$ . electrolytic and that R12 is 100K. A minor tendency toward oscillation may be noted when the Tuning control is in an extreme position of its rotation, but this need not be a problem if L2 is adjusted so that desired stations fall in the main rotation range.

**PROBLEM:** Strong shortwave broadcast audible throughout tuning range

**SOLUTION:** This can occur if your antenna is "too good" or if the RF Gain control is turned up too high. The high sensitivity of the NE602 front end is designed for simple antennas, with most reception quite satisfactory with the RF gain at its midpoint or so.

**PROBLEM:** Local AM radio station audible throughout tuning range

**SOLUTION:** Whether this will even happen depends on how close you are to a local AM station. It is very important that all component leads be as short as possible, since just a bit of wire can help D2 and the several stages of audio amplification give you a free, unwanted "classic crystal radio". A grounded metal case for the SR-1 is one possible solution. Another fix is to solder a .001  $\mu\text{F}$  capacitor in parallel with R10, so that it bypasses the anode of D2 to ground. In theory, this would bypass ALL signals to ground, but this solution has proven effective in two SR-1s constructed by the author.

**PROBLEM:** Unstable, chirpy signals at higher speaker levels

**SOLUTION:** Even in AM mode, signal "chirp" is distinguishable and is a sign that current requirements of the IF and audio stages are swinging the voltage to the NE602 oscillator and varactor tuning. The receiver draws about 200 mA. at peak audio volume, which means that a good fresh alkaline battery is essential. If this poses a serious problem for pleasant listening and your battery budget, consider an external battery supply (D cells), AC power supply, or running the oscillator from its own 9-volt battery as explained in the section for hams and experimenters. For casual listening at moderate speaker volume, or earphone listening, the single 9-volt alkaline

battery will give very satisfactory service.

#### **THE RAMSEY ELECTRONICS CASE, KNOB & HARDWARE OPTION**

Your finished receiver can be installed in a variety of enclosures of your own design and choosing. You might be planning to combine several Ramsey circuit kit boards in a single enclosure. Use of the inexpensive and attractive Ramsey case and knob kit will give your unit that finished look and increase its resale value. These sturdy black instrument cases are supplied with neatly lettered front and rear panels, knobs, rubber feet and mounting screws.

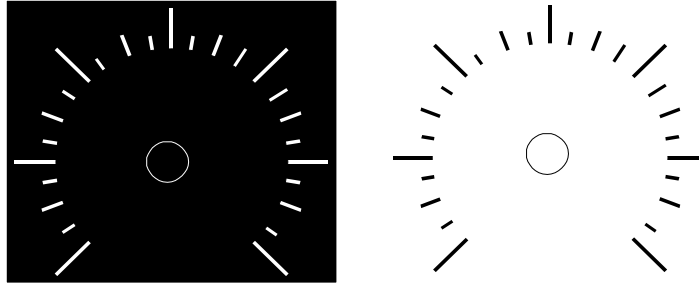
#### **OTHER ENCLOSURE RECOMMENDATIONS**

While we believe that the Ramsey enclosure and knob option is a fine value for finishing off your Ramsey receiver or transmitter, we are happy to give you a couple of additional suggestions and our reasons for them. If your first goal is economy and rugged portability, you will find that the circuit board can be mounted nicely in a standard VHS videotape storage box, which also gives room for a speaker, or earphone storage, and even a roll of antenna wire. The controls are easily mounted at one end of such a box. It may be necessary to cut away the molded posts which secure the tape cassette itself. These storage boxes come in several styles, so pick one which looks truly practical as a project enclosure.

To accomplish RF shielding, the most economical metal enclosure nicely suited for Ramsey kit boards is Radio Shack No. 270-253A. This metal utility cabinet can accommodate both a receiver and our AA-7 Active Antenna, plus speaker, with room for various refinements you might like to add, such as power supply or larger battery pack, etc.

### **A TUNING DIAL?**

If you use your own enclosure and knobs, you will probably plan some sort of dial markings. If you finish your receiver with the Ramsey custom case and knob kit, you may wish to copy one of the following designs to make a logging scale:



**Notes:**

## **The Ramsey Kit Warranty**

**Please read carefully BEFORE calling or writing in about your kit. Most problems can be solved without contacting the factory.**

Notice that this is not a "fine print" warranty. We want you to understand your rights and ours too! All Ramsey kits will work if assembled properly. The very fact that your kit includes this new manual is your assurance that a team of knowledgeable people have field-tested several "copies" of this kit straight from the Ramsey Inventory. If you need help, please read through your manual carefully, all information required to properly build and test your kit is contained within the pages!

**1. DEFECTIVE PARTS:** It's always easy to blame a part for a problem in your kit. Before you conclude that a part may be bad, thoroughly check your work. Today's semiconductors and passive components have reached incredibly high reliability levels, and it's sad to say that our human construction skills have not! But on rare occasions a sour component can slip through. All our kit parts carry the Ramsey Electronics Warranty that they are free from defects for a full ninety (90) days from the date of purchase. Defective parts will be replaced promptly at our expense. If you suspect any part to be defective, please mail it to our factory for testing and replacement. Please send only the defective part (s), not the entire kit. The part(s) MUST be returned to us in suitable condition for testing. Please be aware that testing can usually determine if the part was truly defective or damaged by assembly or usage. Don't be afraid of telling us that you 'blew-it', we're all human and in most cases, replacement parts are very reasonably priced.

**2. MISSING PARTS:** Before assuming a part value is incorrect, check the parts listing carefully to see if it is a critical value such as a specific coil or IC, or whether a RANGE of values is suitable (such as "100 to 500 uF"). Often times, common sense will solve a mysterious missing part problem. If you're missing five 10K ohm resistors and received five extra 1K resistors, you can pretty much be assured that the '1K ohm' resistors are actually the 'missing' 10 K parts ("Hum-m-m, I guess the 'red' band really does look orange!") Ramsey Electronics project kits are packed with pride in the USA. If you believe we packed an incorrect part or omitted a part clearly indicated in your assembly manual as supplied with the basic kit by Ramsey, please write or call us with information on the part you need and proof of kit purchase

**3. FACTORY REPAIR OF ASSEMBLED KITS:**

To qualify for Ramsey Electronics factory repair, kits MUST:

1. NOT be assembled with acid core solder or flux.
2. NOT be modified in any manner.
3. BE returned in fully-assembled form, not partially assembled.
4. BE accompanied by the proper repair fee. No repair will be undertaken until we have received the MINIMUM repair fee (1/2 hour labor) of \$18.00, or authorization to charge it to your credit card account.
5. INCLUDE a description of the problem and legible return address. DO NOT send a separate letter; include all correspondence with the unit. Please do not include your own hardware such as non-Ramsey cabinets, knobs, cables, external battery packs and the like. Ramsey Electronics, Inc., reserves the right to refuse repair on ANY item in which we find excessive problems or damage due to construction methods. To assist customers in such situations, Ramsey Electronics, Inc., reserves the right to solve their needs on a case-by-case basis.

The repair is \$36.00 per hour, regardless of the cost of the kit. Please understand that our technicians are not volunteers and that set-up, testing, diagnosis, repair and repacking and paperwork can take nearly an hour of paid employee time on even a simple kit. Of course, if we find that a part was defective in manufacture, there will be no charge to repair your kit (But please realize that our technicians know the difference between a defective part and parts burned out or damaged through improper use or assembly).

**4. REFUNDS:** You are given ten (10) days to examine our products. If you are not satisfied, you may return your unassembled kit with all the parts and instructions and proof of purchase to the factory for a full refund. The return package should be packed securely. Insurance is recommended. Please do not cause needless delays, read all information carefully.

**SR-1 Shortwave Receiver  
Quick Reference Page Guide**

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**REQUIRED TOOLS**

- Soldering Iron (Radio Shack #RS64-2072)
- Thin Rosin Core Solder (RS64-025)
- Needle Nose Pliers (RS64-1844)
- Small Diagonal Cutters (RS64-1845)
- <OR> Complete Soldering Tool Set  
(RS64-2801)

**TOTAL SOLDER POINTS**

**166**

**ESTIMATED ASSEMBLY  
TIME**

**Beginner ..... 5.0 hrs**  
**Intermediate ..... 3.0 hrs**  
**Advanced..... 2.0 hrs**

**ADDITIONAL SUGGESTED ITEMS**

- Soldering Iron Holder/Cleaner (RS64-2078)

Manual Price Only: \$5.00  
Ramsey Publication No. MSR-1  
Assembly and Instruction manual for:  
***RAMSEY MODEL NO. SR-1***  
***SHORTWAVE RADIO KIT***

**RAMSEY**

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